L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	15/02/2012
Address	1 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 14.94	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 14.91	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 14.91 < TER 14.94	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.30 (max 0.30) 0.30 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.60 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using default y-value of 0.15	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 135.00 litres Nominal cylinder loss = 1.50kWh/day Maximum permitted cylinder loss = 1.77kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00)	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

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Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	15/02/2012
Address	1 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		74.20	(1a) x	2.70	(2a) =	200.34	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	74.20	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	200.34	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
∑(22)1...12 =												54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
∑(22a)1...12 =												13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
∑(22b)1...12 =												2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			8.20	x	1.42	=	11.60	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			35.87	x	0.30	=	10.76	N/A	N/A	(29a)
Party Wall			57.24	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 46.17 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 26.56 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 6.93 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 33.49 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	24.78	23.82	23.82	21.90	20.62	19.98	19.34	19.34	20.94	21.90	22.86	23.82 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	58.27	57.31	57.31	55.39	54.11	53.47	52.83	52.83	54.43	55.39	56.35	57.31

Average = ∑(39)1...12/12 = 55.41 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.79	0.77	0.77	0.75	0.73	0.72	0.71	0.71	0.73	0.75	0.76	0.77

Average = ∑(40)1...12/12 = 0.75 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.34 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.86 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	98.85	95.25	91.66	88.06	84.47	80.88	80.88	84.47	88.06	91.66	95.25	98.85

∑(44)1...12 = 1078.33 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	146.94	128.51	132.61	115.62	110.94	95.73	88.71	101.79	103.01	120.05	131.04	142.30

∑(45)1...12 = 1417.25 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	22.04	19.28	19.89	17.34	16.64	14.36	13.31	15.27	15.45	18.01	19.66	21.35

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	135.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.96	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.81	(54)
Enter (49) or (54) in (55)	0.81	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97	

∑(64)1...12 = 2072.68 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	93.39	82.95	88.63	81.54	81.42	74.93	74.03	78.38	77.35	84.45	86.67	91.85	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	52.12	46.29	37.65	28.50	21.30	17.99	19.43	25.26	33.91	43.05	50.25	53.57	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	308.80	312.00	303.93	286.74	265.04	244.64	231.02	227.81	235.89	253.08	274.78	295.17	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	(71)
Water heating gains (Table 5)													
(72)m	125.53	123.44	119.12	113.25	109.44	104.07	99.50	105.35	107.43	113.51	120.37	123.45	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	594.72	590.02	568.98	536.77	504.06	474.97	458.23	466.70	485.50	517.92	553.68	580.47	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	6.60	x	37.39	x 0.9 x	0.63	x	0.70	=	75.41	(79)
Northeast	0.77	x	1.60	x	11.51	x 0.9 x	0.63	x	0.70	=	5.63	(75)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	81.04	140.07	189.98	241.89	272.50	279.73	272.97	249.35	212.44	160.43	97.52	69.02	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	675.76	730.09	758.95	778.66	776.55	754.70	731.20	716.06	697.94	678.35	651.19	649.49	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.97	0.95	0.90	0.81	0.64	0.45	0.30	0.30	0.52	0.78	0.94	0.97	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.65	20.73	20.83	20.91	20.96	20.96	20.96	20.96	20.96	20.93	20.78	20.66	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.27	20.28	20.28	20.30	20.32	20.32	20.33	20.33	20.31	20.30	20.29	20.28	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.97	0.94	0.88	0.78	0.59	0.41	0.25	0.25	0.47	0.74	0.93	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.81	19.94	20.07	20.19	20.25	20.27	20.28	20.28	20.26	20.21	20.02	19.84	(90)

Living area fraction fLA 26.98 ÷ (4) = 0.36 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

(92)m	20.12	20.23	20.35	20.45	20.51	20.52	20.53	20.53	20.51	20.47	20.30	20.14	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m	19.97	20.08	20.20	20.30	20.36	20.37	20.38	20.38	20.36	20.32	20.15	19.99	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.96	0.94	0.88	0.78	0.60	0.41	0.25	0.26	0.47	0.75	0.93	0.96	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	649.88	683.00	667.76	607.17	463.94	308.35	183.69	183.68	329.25	505.52	602.48	625.21	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	901.27	864.06	767.67	642.72	468.54	308.58	183.69	183.69	329.98	527.47	740.75	864.87	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	187.03	121.67	74.33	25.59	3.42	0.00	0.00	0.00	0.00	16.33	99.56	178.31	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 706.25 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 9.52 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of main heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	187.03	121.67	74.33	25.59	3.42	0.00	0.00	0.00	0.00	16.33	99.56	178.31
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	206.44	134.30	82.04	28.25	3.78	0.00	0.00	0.00	0.00	18.03	109.89	196.81

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 779.53 (211)

Water heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from water heater, kWh/month (calculated above)												
(64)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97

∑(64)1...12 = 2072.68 (64)

Efficiency of water heater per month												
(217)m	84.70	83.91	82.66	81.16	80.09	79.90	79.90	79.90	79.90	80.71	83.34	84.64
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	239.20	213.07	227.77	208.84	208.02	187.24	180.69	197.07	196.35	217.71	221.86	233.90

Total per year (kWh/year) = ∑(219)1...12 = 2531.72 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		779.53	(211)
Water heating fuel used		2531.72	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	122.21		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	297.21	(231)
Electricity for lighting (calculated in Appendix L):		368.17	(232)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	779.53	x	3.10	x 0.01 =	24.17	(240)
Water heating cost (other fuel)	2531.72	x	3.10	x 0.01 =	78.48	(247)
Pumps, fans and electric keep-hot	297.21	x	11.46	x 0.01 =	34.06	(249)
Energy for lighting	368.17	x	11.46	x 0.01 =	42.19	(250)
Additional standing charges (Table 12)					106.00	(251)
Total energy cost				(240)...(242) + (245)...(254)	284.90	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)	0.47	(256)

Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.12	(257)
SAP value		84.33	
SAP rating		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	779.53	x	0.198	=	154.35	(261)
Water heating	2531.72	x	0.198	=	501.28	(264)
Space and water heating			(261) + (262) + (263) + (264) =		655.63	(265)
Pumps, fans and electric keep-hot	297.21	x	0.517	=	153.66	(267)
Lighting	368.17	x	0.517	=	190.34	(268)
Total carbon dioxide emissions			∑(261)...(271) =		999.63	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		13.47	(273)
EI value					88.76	
EI rating (see section 14)					89	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	779.53	x	1.02	=	795.12	(261*)
Water heating	2531.72	x	1.02	=	2582.35	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		3377.47	(265*)
Pumps, fans and electric keep-hot	297.21	x	2.92	=	867.85	(267*)
Lighting	368.17	x	2.92	=	1075.05	(268*)
Total primary energy kWh/year			∑(261*)...(271*) =		5320.37	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		71.70	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	1 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 14.94	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 9.67	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 9.67 < TER 14.94	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.20 (max 0.30) 0.20 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.60 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using default y-value of 0.15	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 135.00 litres Nominal cylinder loss = 1.50kWh/day Maximum permitted cylinder loss = 1.77kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00) Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	1 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		74.20	(1a) x	2.70	(2a) =	200.34	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	74.20	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	200.34	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			8.20	x	1.42	=	11.60	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			35.87	x	0.20	=	7.17	N/A	N/A	(29a)
Party Wall			57.24	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 46.17 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 22.98 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 6.93 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 29.90 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	24.78	23.82	23.82	21.90	20.62	19.98	19.34	19.34	20.94	21.90	22.86	23.82 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	54.68	53.72	53.72	51.80	50.52	49.88	49.24	49.24	50.84	51.80	52.76	53.72

Average = ∑(39)1...12/12 = 51.83 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.74	0.72	0.72	0.70	0.68	0.67	0.66	0.66	0.69	0.70	0.71	0.72

Average = ∑(40)1...12/12 = 0.70 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.34 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.86 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	98.85	95.25	91.66	88.06	84.47	80.88	80.88	84.47	88.06	91.66	95.25	98.85

∑(44)1...12 = 1078.33 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	146.94	128.51	132.61	115.62	110.94	95.73	88.71	101.79	103.01	120.05	131.04	142.30

∑(45)1...12 = 1417.25 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	22.04	19.28	19.89	17.34	16.64	14.36	13.31	15.27	15.45	18.01	19.66	21.35 (46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	135.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.96	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.81	(54)
Enter (49) or (54) in (55)	0.81	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97	

∑(64)1...12 = 2072.68 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	93.39	82.95	88.63	81.54	81.42	74.93	74.03	78.38	77.35	84.45	86.67	91.85	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	140.62	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	52.12	46.29	37.65	28.50	21.30	17.99	19.43	25.26	33.91	43.05	50.25	53.57	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	308.80	312.00	303.93	286.74	265.04	244.64	231.02	227.81	235.89	253.08	274.78	295.17	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	51.41	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	-93.75	(71)
Water heating gains (Table 5)													
(72)m	125.53	123.44	119.12	113.25	109.44	104.07	99.50	105.35	107.43	113.51	120.37	123.45	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	594.72	590.02	568.98	536.77	504.06	474.97	458.23	466.70	485.50	517.92	553.68	580.47	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	6.60	x	37.39	x 0.9 x	0.63	x	0.70	=	75.41	(79)
Northeast	0.77	x	1.60	x	11.51	x 0.9 x	0.63	x	0.70	=	5.63	(75)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	81.04	140.07	189.98	241.89	272.50	279.73	272.97	249.35	212.44	160.43	97.52	69.02	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	675.76	730.09	758.95	778.66	776.55	754.70	731.20	716.06	697.94	678.35	651.19	649.49	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.97	0.94	0.88	0.78	0.60	0.42	0.28	0.28	0.49	0.75	0.93	0.97	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.71	20.78	20.87	20.93	20.96	20.97	20.97	20.97	20.96	20.94	20.83	20.72	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.31	20.32	20.32	20.34	20.36	20.37	20.37	20.37	20.35	20.34	20.33	20.32	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.96	0.93	0.86	0.75	0.56	0.38	0.23	0.24	0.44	0.71	0.91	0.96	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.93	20.05	20.16	20.26	20.30	20.32	20.32	20.32	20.30	20.27	20.11	19.96	(90)

Living area fraction fLA 26.98 ÷ (4) = 0.36 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

(92)m	20.21	20.31	20.42	20.50	20.54	20.55	20.56	20.56	20.54	20.52	20.37	20.23	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m	20.06	20.16	20.27	20.35	20.39	20.40	20.41	20.41	20.39	20.37	20.22	20.08	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.95	0.92	0.86	0.75	0.56	0.38	0.24	0.24	0.44	0.71	0.91	0.96	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	645.28	674.06	651.69	581.78	436.92	289.29	172.69	172.69	309.47	482.51	592.97	620.70	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	850.94	814.66	723.37	603.65	439.17	289.38	172.69	172.69	309.78	495.53	697.70	815.72	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	153.01	94.48	53.33	15.75	1.68	0.00	0.00	0.00	0.00	9.69	75.40	145.10	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 548.44 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 7.39 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of main heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	153.01	94.48	53.33	15.75	1.68	0.00	0.00	0.00	0.00	9.69	75.40	145.10
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	168.89	104.29	58.86	17.38	1.85	0.00	0.00	0.00	0.00	10.69	83.23	160.15

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 605.34 (211)

Water heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from water heater, kWh/month (calculated above)												
(64)m	202.61	178.79	188.28	169.49	166.60	149.60	144.37	157.46	156.88	175.71	184.91	197.97

∑(64)1...12 = 2072.68 (64)

Efficiency of water heater per month												
(217)m	84.18	83.30	82.04	80.71	79.99	79.90	79.90	79.90	79.90	80.40	82.73	84.10
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	240.69	214.63	229.50	209.99	208.27	187.24	180.69	197.07	196.35	218.56	223.51	235.39

Total per year (kWh/year) = ∑(219)1...12 = 2541.91 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		605.34	(211)
Water heating fuel used		2541.91	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	122.21		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	297.21	(231)
Electricity for lighting (calculated in Appendix L):		368.17	(232)
Energy saving/generation technologies (Appendices M, N and Q):			
Electricity generated by PVs (Appendix M) (negative quantity)		-657.28	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	605.34	x	3.10	x 0.01 =	18.77	(240)
Water heating cost (other fuel)	2541.91	x	3.10	x 0.01 =	78.80	(247)
Pumps, fans and electric keep-hot	297.21	x	11.46	x 0.01 =	34.06	(249)
Energy for lighting	368.17	x	11.46	x 0.01 =	42.19	(250)
Additional standing charges (Table 12)					106.00	(251)

Energy saving/generation technologies (Appendices M, N and Q):

PV savings (negative quantity)	-657.28	x	11.46	x 0.01 =	-75.32	(252)
Total energy cost			(240)...(242) + (245)...(254)		204.49	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.81	(257)
SAP value		88.75	
SAP rating		89	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	605.34	x	0.198	=	119.86	(261)
Water heating	2541.91	x	0.198	=	503.30	(264)
Space and water heating			(261) + (262) + (263) + (264) =		623.15	(265)
Pumps, fans and electric keep-hot	297.21	x	0.517	=	153.66	(267)
Lighting	368.17	x	0.517	=	190.34	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-657.28	x	0.529	=	-347.70	(269)
Total carbon dioxide emissions			∑(261)...(271) =		619.45	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		8.35	(273)
EI value					93.04	
EI rating (see section 14)					93	(274)
EI band					A	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	605.34	x	1.02	=	617.45	(261*)
Water heating	2541.91	x	1.02	=	2592.74	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		3210.19	(265*)
Pumps, fans and electric keep-hot	297.21	x	2.92	=	867.85	(267*)
Lighting	368.17	x	2.92	=	1075.05	(268*)
Energy saving/generation technologies:						
PV primary energy savings (negative quantity)	-657.28	x	2.92	=	-1919.26	(269*)
Total primary energy kWh/year			∑(261*)...(271*) =		3233.83	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		43.58	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	2 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.42	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 16.37	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 16.37 < TER 16.42	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.30 (max 0.30) 0.30 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.60 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.1, with reference: test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 90.00 litres Nominal cylinder loss = 1.14kWh/day Maximum permitted cylinder loss = 1.41kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00)	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	2 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		64.95	(1a) x	2.70	(2a) =	175.36	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	64.95	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	175.36	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			8.16	x	1.42	=	11.55	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			42.61	x	0.30	=	12.78	N/A	N/A	(29a)
Party Wall			44.55	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 52.87 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 28.53 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 5.29 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 33.82 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	21.69	20.85	20.85	19.17	18.05	17.49	16.93	16.93	18.33	19.17	20.01	20.85 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	55.51	54.67	54.67	52.98	51.86	51.30	50.74	50.74	52.14	52.98	53.83	54.67

Average = ∑(39)1...12/12 = 53.01 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.85	0.84	0.84	0.82	0.80	0.79	0.78	0.78	0.80	0.82	0.83	0.84

Average = ∑(40)1...12/12 = 0.82 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.12 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 84.49 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	92.94	89.56	86.18	82.80	79.42	76.04	76.04	79.42	82.80	86.18	89.56	92.94

∑(44)1...12 = 1013.91 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	138.16	120.84	124.69	108.71	104.31	90.01	83.41	95.71	96.86	112.88	123.21	133.80

∑(45)1...12 = 1332.58 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	20.72	18.13	18.70	16.31	15.65	13.50	12.51	14.36	14.53	16.93	18.48	20.07 (46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	90.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	1.10	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.62	(54)
Enter (49) or (54) in (55)	0.62	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	19.15	17.30	19.15	18.53	19.15	18.53	19.15	19.15	18.53	19.15	18.53	19.15	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	19.15	17.30	19.15	18.53	19.15	18.53	19.15	19.15	18.53	19.15	18.53	19.15	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52	

∑(64)1...12 = 1918.04 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	85.72	76.11	81.24	74.64	74.46	68.42	67.51	71.60	70.70	77.31	79.46	84.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	45.36	40.29	32.77	24.81	18.54	15.65	16.91	21.99	29.51	37.47	43.73	46.62	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	276.47	279.34	272.11	256.72	237.29	219.03	206.83	203.97	211.19	226.59	246.01	264.27	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	(71)
Water heating gains (Table 5)													
(72)m	115.21	113.26	109.19	103.67	100.08	95.03	90.74	96.24	98.19	103.91	110.37	113.26	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	539.22	535.06	516.24	487.37	458.09	431.90	416.67	424.37	441.08	470.14	502.29	526.33	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Northeast	0.77	x	4.80	x	11.51	x 0.9 x	0.63	x	0.70	=	16.88	(75)
Southwest	0.77	x	1.12	x	37.39	x 0.9 x	0.63	x	0.70	=	12.80	(79)
Southeast	0.77	x	2.24	x	37.39	x 0.9 x	0.63	x	0.70	=	25.59	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	55.28	100.00	146.81	205.72	248.06	261.16	252.22	218.80	170.57	117.73	67.34	46.54	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	594.50	635.06	663.05	693.09	706.16	693.06	668.88	643.17	611.64	587.87	569.63	572.87	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.98	0.96	0.92	0.84	0.67	0.47	0.31	0.32	0.57	0.83	0.96	0.98	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.57	20.66	20.77	20.88	20.95	20.96	20.96	20.96	20.96	20.90	20.72	20.59	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.21	20.22	20.22	20.24	20.26	20.26	20.27	20.27	20.25	20.24	20.23	20.22	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.97	0.95	0.91	0.81	0.62	0.42	0.26	0.27	0.50	0.79	0.94	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.65	19.78	19.93	20.10	20.18	20.20	20.21	20.21	20.19	20.12	19.87	19.68	(90)

Living area fraction fLA 29.40 ÷ (4) = 0.45 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	20.07	20.17	20.31	20.45	20.53	20.55	20.55	20.55	20.54	20.47	20.26	20.09	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.92	20.02	20.16	20.30	20.38	20.40	20.40	20.40	20.39	20.32	20.11	19.94	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.97	0.95	0.90	0.81	0.63	0.43	0.27	0.28	0.52	0.79	0.94	0.97	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	575.72	603.40	599.90	562.85	442.26	296.84	177.66	177.65	315.58	467.23	536.22	555.13	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	855.85	821.30	730.49	614.66	450.14	297.35	177.67	177.67	317.39	504.57	705.46	822.44	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	208.42	146.43	97.16	37.31	5.86	0.00	0.00	0.00	0.00	27.78	121.86	198.88	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 843.70 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 12.99 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	208.42	146.43	97.16	37.31	5.86	0.00	0.00	0.00	0.00	27.78	121.86	198.88
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	230.04	161.62	107.24	41.18	6.47	0.00	0.00	0.00	0.00	30.66	134.50	219.52

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 931.23 (211)

Water heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from water heater, kWh/month (calculated above)												
(64)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52

∑(64)1...12 = 1918.04 (64)

Efficiency of water heater per month												
(217)m	85.19	84.59	83.42	81.76	80.25	79.90	79.90	79.90	79.90	81.30	84.02	85.13
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	220.54	195.95	209.07	191.83	191.95	172.88	166.62	182.02	181.45	200.00	203.91	215.58

Total per year (kWh/year) = ∑(219)1...12 = 2331.80 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		931.23	(211)
Water heating fuel used		2331.80	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	106.97		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	281.97	(231)
Electricity for lighting (calculated in Appendix L):		320.44	(232)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		**Fuel price (Table 12)**		**Fuel cost £/year**	
Space heating - main system 1	931.23	x	3.10	x 0.01 =	28.87	(240)
Water heating cost (other fuel)	2331.80	x	3.10	x 0.01 =	72.29	(247)
Pumps, fans and electric keep-hot	281.97	x	11.46	x 0.01 =	32.31	(249)
Energy for lighting	320.44	x	11.46	x 0.01 =	36.72	(250)
Additional standing charges (Table 12)					106.00	(251)
Total energy cost				(240)...(242) + (245)...(254)	276.19	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.18	(257)
SAP value		83.53	
SAP rating		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	931.23	x	0.198	=	184.38	(261)
Water heating	2331.80	x	0.198	=	461.70	(264)
Space and water heating			(261) + (262) + (263) + (264) =		646.08	(265)
Pumps, fans and electric keep-hot	281.97	x	0.517	=	145.78	(267)
Lighting	320.44	x	0.517	=	165.67	(268)
Total carbon dioxide emissions			∑(261)...(271) =		957.53	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		14.74	(273)
EI value					88.33	
EI rating (see section 14)					88	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	931.23	x	1.02	=	949.86	(261*)
Water heating	2331.80	x	1.02	=	2378.43	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		3328.29	(265*)
Pumps, fans and electric keep-hot	281.97	x	2.92	=	823.36	(267*)
Lighting	320.44	x	2.92	=	935.67	(268*)
Total primary energy kWh/year			∑(261*)...(271*) =		5087.32	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		78.33	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	2 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.42	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 10.72	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 10.72 < TER 16.42	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.20 (max 0.30) / 0.20 (max 0.70) Party wall: 0.00 (max 0.20) / N/A Floor: (no floor) Roof: (no roof) Openings: 1.60 (max 2.00) / 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using default y-value of 0.15	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 90.00 litres Nominal cylinder loss = 1.14kWh/day Maximum permitted cylinder loss = 1.41kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00) Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	2 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		64.95	(1a) x	2.70	(2a) =	175.36	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	64.95	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	175.36	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			8.16	x	1.42	=	11.55	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			42.61	x	0.20	=	8.52	N/A	N/A	(29a)
Party Wall			44.55	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 52.87 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 24.27 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 7.93 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 32.20 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	21.69	20.85	20.85	19.17	18.05	17.49	16.93	16.93	18.33	19.17	20.01	20.85 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	53.89	53.05	53.05	51.37	50.25	49.69	49.12	49.12	50.53	51.37	52.21	53.05

Average = ∑(39)1...12/12 = 51.39 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.83	0.82	0.82	0.79	0.77	0.76	0.76	0.76	0.78	0.79	0.80	0.82

Average = ∑(40)1...12/12 = 0.79 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.12 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 84.49 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	92.94	89.56	86.18	82.80	79.42	76.04	76.04	79.42	82.80	86.18	89.56	92.94

∑(44)1...12 = 1013.91 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	138.16	120.84	124.69	108.71	104.31	90.01	83.41	95.71	96.86	112.88	123.21	133.80

∑(45)1...12 = 1332.58 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	20.72	18.13	18.70	16.31	15.65	13.50	12.51	14.36	14.53	16.93	18.48	20.07

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	90.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	1.10	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.62	(54)
Enter (49) or (54) in (55)	0.62	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	19.15	17.30	19.15	18.53	19.15	18.53	19.15	19.15	18.53	19.15	18.53	19.15	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	19.15	17.30	19.15	18.53	19.15	18.53	19.15	19.15	18.53	19.15	18.53	19.15	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52	

∑(64)1...12 = 1918.04 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	85.72	76.11	81.24	74.64	74.46	68.42	67.51	71.60	70.70	77.31	79.46	84.27	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	127.06	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	45.36	40.29	32.77	24.81	18.54	15.65	16.91	21.99	29.51	37.47	43.73	46.62	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	276.47	279.34	272.11	256.72	237.29	219.03	206.83	203.97	211.19	226.59	246.01	264.27	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	49.82	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	-84.70	(71)
Water heating gains (Table 5)													
(72)m	115.21	113.26	109.19	103.67	100.08	95.03	90.74	96.24	98.19	103.91	110.37	113.26	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	539.22	535.06	516.24	487.37	458.09	431.90	416.67	424.37	441.08	470.14	502.29	526.33	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Northeast	0.77	x	4.80	x	11.51	x 0.9 x	0.63	x	0.70	=	16.88	(75)
Southwest	0.77	x	1.12	x	37.39	x 0.9 x	0.63	x	0.70	=	12.80	(79)
Southeast	0.77	x	2.24	x	37.39	x 0.9 x	0.63	x	0.70	=	25.59	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	55.28	100.00	146.81	205.72	248.06	261.16	252.22	218.80	170.57	117.73	67.34	46.54	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	594.50	635.06	663.05	693.09	706.16	693.06	668.88	643.17	611.64	587.87	569.63	572.87	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.98	0.96	0.92	0.83	0.65	0.46	0.30	0.31	0.55	0.82	0.95	0.98	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.60	20.68	20.79	20.89	20.95	20.96	20.96	20.96	20.96	20.91	20.74	20.62	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.23	20.24	20.24	20.26	20.28	20.28	20.29	20.29	20.27	20.26	20.25	20.24	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.97	0.95	0.90	0.80	0.60	0.41	0.25	0.26	0.49	0.78	0.94	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.71	19.83	19.98	20.13	20.21	20.23	20.24	20.24	20.21	20.15	19.93	19.74	(90)

Living area fraction fLA 29.40 ÷ (4) = 0.45 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	20.11	20.22	20.35	20.48	20.55	20.56	20.56	20.56	20.55	20.50	20.30	20.14	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.96	20.07	20.20	20.33	20.40	20.41	20.41	20.41	20.40	20.35	20.15	19.99	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.97	0.95	0.90	0.80	0.61	0.42	0.26	0.27	0.50	0.78	0.94	0.97	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	574.49	601.09	595.27	554.05	430.96	288.29	172.65	172.64	306.94	459.46	533.67	553.92	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	833.36	799.30	710.81	597.26	436.92	288.64	172.66	172.66	308.25	490.36	686.29	800.48	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	192.60	133.20	85.96	31.11	4.43	0.00	0.00	0.00	0.00	22.99	109.88	183.45	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 763.62 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 11.76 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	192.60	133.20	85.96	31.11	4.43	0.00	0.00	0.00	0.00	22.99	109.88	183.45
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	212.58	147.02	94.88	34.34	4.89	0.00	0.00	0.00	0.00	25.38	121.28	202.48

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 842.84 (211)

Water heating:

Output from water heater, kWh/month (calculated above)												
(64)m	187.88	165.75	174.42	156.83	154.03	138.13	133.13	145.44	144.98	162.60	171.33	183.52

∑(64)1...12 = 1918.04 (64)

Efficiency of water heater per month												
(217)m	84.98	84.34	83.14	81.49	80.16	79.90	79.90	79.90	79.90	81.09	83.77	84.91
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	221.09	196.53	209.78	192.44	192.15	172.88	166.62	182.02	181.45	200.53	204.54	216.13

Total per year (kWh/year) = ∑(219)1...12 = 2336.16 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		842.84	(211)
Water heating fuel used		2336.16	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	106.97		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	281.97	(231)
Electricity for lighting (calculated in Appendix L):		320.44	(232)
Energy saving/generation technologies (Appendices M, N and Q):			
Electricity generated by PVs (Appendix M) (negative quantity)		-657.28	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		**Fuel price (Table 12)**		**Fuel cost £/year**	
Space heating - main system 1	842.84	x	3.10	x 0.01 =	26.13	(240)
Water heating cost (other fuel)	2336.16	x	3.10	x 0.01 =	72.42	(247)
Pumps, fans and electric keep-hot	281.97	x	11.46	x 0.01 =	32.31	(249)
Energy for lighting	320.44	x	11.46	x 0.01 =	36.72	(250)
Additional standing charges (Table 12)					106.00	(251)

Energy saving/generation technologies (Appendices M, N and Q):

PV savings (negative quantity)	-657.28	x	11.46	x 0.01 =	-75.32	(252)
Total energy cost			(240)...(242) + (245)...(254)		198.26	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.85	(257)
SAP value		88.18	
SAP rating		88	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	842.84	x	0.198	=	166.88	(261)
Water heating	2336.16	x	0.198	=	462.56	(264)
Space and water heating			(261) + (262) + (263) + (264) =		629.44	(265)
Pumps, fans and electric keep-hot	281.97	x	0.517	=	145.78	(267)
Lighting	320.44	x	0.517	=	165.67	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-657.28	x	0.529	=	-347.70	(269)
Total carbon dioxide emissions				∑(261)...(271) =	593.19	(272)
Dwelling carbon dioxide emissions rate				(272) ÷ (4) =	9.13	(273)
EI value					92.77	
EI rating (see section 14)					93	(274)
EI band					A	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	842.84	x	1.02	=	859.70	(261*)
Water heating	2336.16	x	1.02	=	2382.88	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		3242.58	(265*)
Pumps, fans and electric keep-hot	281.97	x	2.92	=	823.36	(267*)
Lighting	320.44	x	2.92	=	935.67	(268*)
Energy saving/generation technologies:						
PV primary energy savings (negative quantity)	-657.28	x	2.92	=	-1919.26	(269*)
Total primary energy kWh/year				∑(261*)...(271*) =	3082.35	(272*)
Primary energy kWh/m2/year				(272*) ÷ (4) =	47.46	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	3 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.29	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 16.25	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 16.25 < TER 16.29	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.30 (max 0.30) 0.30 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.56 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.11, with reference: Test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 180.00 litres Nominal cylinder loss = 1.82kWh/day Maximum permitted cylinder loss = 2.10kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00)	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	3 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		98.16	(1a) x	3.10	(2a) =	304.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	98.16	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	304.30	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys		0	x 40 =	0	(6a)
Number of open flues		0	x 20 =	0	(6b)
Number of intermittent fans		0	x 10 =	0	(7a)
Number of passive vents		0	x 10 =	0	(7b)
Number of flueless gas fires		0	x 40 =	0	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			15.20	x	1.42	=	21.51	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			85.93	x	0.30	=	25.78	N/A	N/A	(29a)
Party Wall			69.44	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 103.23 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 51.49 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 11.36 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 62.84 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	37.64	36.18	36.18	33.26	31.31	30.34	29.37	29.37	31.80	33.26	34.72	36.18 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	100.48	99.02	99.02	96.10	94.16	93.19	92.21	92.21	94.64	96.10	97.56	99.02

Average = ∑(39)1...12/12 = 96.14 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	1.02	1.01	1.01	0.98	0.96	0.95	0.94	0.94	0.96	0.98	0.99	1.01

Average = ∑(40)1...12/12 = 0.98 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.72 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.84 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	108.73	104.77	100.82	96.87	92.91	88.96	88.96	92.91	96.87	100.82	104.77	108.73

∑(44)1...12 = 1186.12 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	161.63	141.36	145.87	127.17	122.03	105.30	97.57	111.97	113.31	132.05	144.14	156.53

∑(45)1...12 = 1558.91 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	24.24	21.20	21.88	19.08	18.30	15.79	14.64	16.80	17.00	19.81	21.62	23.48

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	180.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.87	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.98	(54)
Enter (49) or (54) in (55)	0.98	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	

∑(64)1...12 = 2276.81 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	102.52	91.06	97.28	89.49	89.35	82.22	81.22	86.01	84.88	92.68	95.13	100.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	59.29	52.66	42.83	32.42	24.24	20.46	22.11	28.74	38.57	48.98	57.16	60.94	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	378.09	382.01	372.12	351.08	324.51	299.54	282.85	278.93	288.82	309.86	336.43	361.40	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	(71)
Water heating gains (Table 5)													
(72)m	137.79	135.50	130.75	124.29	120.10	114.19	109.17	115.60	117.89	124.57	132.13	135.51	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	693.66	688.67	664.19	626.28	587.33	552.68	532.62	541.76	563.77	601.91	644.21	676.35	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	4.80	x	37.39	x 0.9 x	0.63	x	0.70	=	54.85	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	124.33	219.44	309.04	412.68	481.53	500.96	486.17	432.28	352.10	254.60	150.44	105.34	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	817.99	908.11	973.23	1038.95	1068.86	1053.64	1018.79	974.04	915.87	856.50	794.66	781.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.96	0.90	0.76	0.56	0.37	0.39	0.66	0.90	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.33	20.44	20.60	20.77	20.90	20.95	20.95	20.95	20.93	20.80	20.52	20.35	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.07	20.08	20.08	20.10	20.12	20.13	20.14	20.14	20.11	20.10	20.09	20.08	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.97	0.94	0.87	0.70	0.49	0.29	0.31	0.59	0.87	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.18	19.35	19.58	19.83	20.01	20.06	20.07	20.07	20.03	19.87	19.47	19.22	(90)

Living area fraction fLA 29.20 ÷ (4) = 0.30 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.52	19.67	19.88	20.11	20.27	20.32	20.33	20.33	20.30	20.15	19.79	19.55	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.37	19.52	19.73	19.96	20.12	20.17	20.18	20.18	20.15	20.00	19.64	19.40	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.94	0.87	0.70	0.49	0.30	0.31	0.59	0.86	0.97	0.98	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	804.44	881.20	912.99	901.90	751.73	514.94	302.45	302.40	541.58	740.38	769.77	769.58	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1494.22	1438.29	1280.69	1081.97	793.08	519.08	302.61	302.60	553.80	883.84	1232.72	1436.21	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	513.20	374.36	273.56	129.65	30.77	0.00	0.00	0.00	0.00	106.74	333.32	495.97	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 2257.58 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 23.00 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	513.20	374.36	273.56	129.65	30.77	0.00	0.00	0.00	0.00	106.74	333.32	495.97
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	566.45	413.21	301.95	143.10	33.96	0.00	0.00	0.00	0.00	117.81	367.91	547.43

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 2491.81 (211)

Water heating:

Output from water heater, kWh/month (calculated above)												
(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50

∑(64)1...12 = 2276.81 (64)

Efficiency of water heater per month												
(217)m	87.07	86.61	85.66	83.97	81.28	79.90	79.90	79.90	79.90	83.41	86.23	87.05
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	255.65	226.80	241.47	221.72	225.14	205.64	198.43	216.45	215.66	231.42	235.59	249.86

Total per year (kWh/year) = ∑(219)1...12 = 2723.81 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2491.81	(211)
Water heating fuel used		2723.81	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	185.62		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	360.62	(231)
Electricity for lighting (calculated in Appendix L):		418.84	(232)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		**Fuel price (Table 12)**		**Fuel cost £/year**	
Space heating - main system 1	2491.81	x	3.10	x 0.01 =	77.25	(240)
Water heating cost (other fuel)	2723.81	x	3.10	x 0.01 =	84.44	(247)
Pumps, fans and electric keep-hot	360.62	x	11.46	x 0.01 =	41.33	(249)
Energy for lighting	418.84	x	11.46	x 0.01 =	48.00	(250)
Additional standing charges (Table 12)					106.00	(251)
Total energy cost			(240)...(242) + (245)...(254)		357.01	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.17	(257)
SAP value		83.65	
SAP rating		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	2491.81	x	0.198	=	493.38	(261)
Water heating	2723.81	x	0.198	=	539.32	(264)
Space and water heating			(261) + (262) + (263) + (264) =		1032.69	(265)
Pumps, fans and electric keep-hot	360.62	x	0.517	=	186.44	(267)
Lighting	418.84	x	0.517	=	216.54	(268)
Total carbon dioxide emissions			∑(261)...(271) =		1435.67	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		14.63	(273)
EI value					86.56	
EI rating (see section 14)					87	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	2491.81	x	1.02	=	2541.64	(261*)
Water heating	2723.81	x	1.02	=	2778.29	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		5319.93	(265*)
Pumps, fans and electric keep-hot	360.62	x	2.92	=	1053.01	(267*)
Lighting	418.84	x	2.92	=	1223.00	(268*)
Total primary energy kWh/year			∑(261*)...(271*) =		7595.95	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		77.38	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	3 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.29	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 12.16	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 12.16 < TER 16.29	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.20 (max 0.30) / 0.20 (max 0.70) Party wall: 0.00 (max 0.20) / N/A Floor: (no floor) Roof: (no roof) Openings: 1.56 (max 2.00) / 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using default y-value of 0.15	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 180.00 litres Nominal cylinder loss = 1.82kWh/day Maximum permitted cylinder loss = 2.10kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00) Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	3 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		98.16	(1a) x	3.10	(2a) =	304.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	98.16	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	304.30	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36	(24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36	(25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			15.20	x	1.42	=	21.51	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			85.93	x	0.20	=	17.19	N/A	N/A	(29a)
Party Wall			69.44	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 103.23 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 42.90 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 15.48 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 58.38 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	37.64	36.18	36.18	33.26	31.31	30.34	29.37	29.37	31.80	33.26	34.72	36.18	(38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	96.02	94.56	94.56	91.64	89.69	88.72	87.75	87.75	90.18	91.64	93.10	94.56	

Average = ∑(39)1...12/12 = 91.68 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.98	0.96	0.96	0.93	0.91	0.90	0.89	0.89	0.92	0.93	0.95	0.96	

Average = ∑(40)1...12/12 = 0.93 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.72 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.84 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m	108.73	104.77	100.82	96.87	92.91	88.96	88.96	92.91	96.87	100.82	104.77	108.73	

∑(44)1...12 = 1186.12 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	161.63	141.36	145.87	127.17	122.03	105.30	97.57	111.97	113.31	132.05	144.14	156.53	

∑(45)1...12 = 1558.91 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	24.24	21.20	21.88	19.08	18.30	15.79	14.64	16.80	17.00	19.81	21.62	23.48	(46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	180.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.87	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.98	(54)
Enter (49) or (54) in (55)	0.98	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	

∑(64)1...12 = 2276.81 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	102.52	91.06	97.28	89.49	89.35	82.22	81.22	86.01	84.88	92.68	95.13	100.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	59.29	52.66	42.83	32.42	24.24	20.46	22.11	28.74	38.57	48.98	57.16	60.94	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	378.09	382.01	372.12	351.08	324.51	299.54	282.85	278.93	288.82	309.86	336.43	361.40	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	(71)
Water heating gains (Table 5)													
(72)m	137.79	135.50	130.75	124.29	120.10	114.19	109.17	115.60	117.89	124.57	132.13	135.51	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	693.66	688.67	664.19	626.28	587.33	552.68	532.62	541.76	563.77	601.91	644.21	676.35	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	4.80	x	37.39	x 0.9 x	0.63	x	0.70	=	54.85	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	124.33	219.44	309.04	412.68	481.53	500.96	486.17	432.28	352.10	254.60	150.44	105.34	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	817.99	908.11	973.23	1038.95	1068.86	1053.64	1018.79	974.04	915.87	856.50	794.66	781.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.95	0.89	0.73	0.53	0.35	0.37	0.64	0.89	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.38	20.49	20.64	20.80	20.92	20.95	20.96	20.96	20.94	20.83	20.56	20.40	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.10	20.12	20.12	20.14	20.16	20.17	20.17	20.17	20.15	20.14	20.13	20.12	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.97	0.94	0.86	0.68	0.47	0.28	0.29	0.57	0.86	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.28	19.45	19.67	19.90	20.06	20.10	20.11	20.11	20.08	19.94	19.57	19.32	(90)

Living area fraction fLA 29.20 ÷ (4) = 0.30 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.61	19.76	19.96	20.17	20.31	20.35	20.36	20.36	20.34	20.20	19.86	19.64	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.46	19.61	19.81	20.02	20.16	20.20	20.21	20.21	20.19	20.05	19.71	19.49	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.93	0.86	0.68	0.47	0.29	0.30	0.57	0.85	0.97	0.98	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	803.70	879.23	907.80	889.03	728.88	494.33	290.46	290.43	522.26	729.72	767.86	768.91	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1436.31	1381.61	1230.24	1037.50	759.19	496.98	290.55	290.55	530.72	847.96	1183.66	1379.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	470.66	337.61	239.89	106.89	22.55	0.00	0.00	0.00	0.00	87.97	299.37	454.42	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 2019.37 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 20.57 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	470.66	337.61	239.89	106.89	22.55	0.00	0.00	0.00	0.00	87.97	299.37	454.42
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	519.49	372.63	264.78	117.98	24.89	0.00	0.00	0.00	0.00	97.10	330.43	501.57

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 2228.88 (211)

Water heating:

Output from water heater, kWh/month (calculated above)												
(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50

∑(64)1...12 = 2276.81 (64)

Efficiency of water heater per month												
(217)m	86.86	86.35	85.31	83.50	80.95	79.90	79.90	79.90	79.90	82.97	85.95	86.84
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	256.26	227.49	242.46	222.98	226.07	205.64	198.43	216.45	215.66	232.64	236.36	250.47

Total per year (kWh/year) = ∑(219)1...12 = 2730.89 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2228.88	(211)
Water heating fuel used		2730.89	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	185.62		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	360.62	(231)
Electricity for lighting (calculated in Appendix L):		418.84	(232)
Energy saving/generation technologies (Appendices M, N and Q):			
Electricity generated by PVs (Appendix M) (negative quantity)		-657.28	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		**Fuel price (Table 12)**		**Fuel cost £/year**	
Space heating - main system 1	2228.88	x	3.10	x 0.01 =	69.10	(240)
Water heating cost (other fuel)	2730.89	x	3.10	x 0.01 =	84.66	(247)
Pumps, fans and electric keep-hot	360.62	x	11.46	x 0.01 =	41.33	(249)
Energy for lighting	418.84	x	11.46	x 0.01 =	48.00	(250)
Additional standing charges (Table 12)					106.00	(251)

Energy saving/generation technologies (Appendices M, N and Q):

PV savings (negative quantity)	-657.28	x	11.46	x 0.01 =	-75.32	(252)
Total energy cost			(240)...(242) + (245)...(254)		273.75	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.90	(257)
SAP value		87.46	
SAP rating		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	2228.88	x	0.198	=	441.32	(261)
Water heating	2730.89	x	0.198	=	540.72	(264)
Space and water heating			(261) + (262) + (263) + (264) =		982.04	(265)
Pumps, fans and electric keep-hot	360.62	x	0.517	=	186.44	(267)
Lighting	418.84	x	0.517	=	216.54	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-657.28	x	0.529	=	-347.70	(269)
Total carbon dioxide emissions				∑(261)...(271) =	1037.31	(272)
Dwelling carbon dioxide emissions rate				(272) ÷ (4) =	10.57	(273)
EI value					90.29	
EI rating (see section 14)					90	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	2228.88	x	1.02	=	2273.46	(261*)
Water heating	2730.89	x	1.02	=	2785.51	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		5058.97	(265*)
Pumps, fans and electric keep-hot	360.62	x	2.92	=	1053.01	(267*)
Lighting	418.84	x	2.92	=	1223.00	(268*)
Energy saving/generation technologies:						
PV primary energy savings (negative quantity)	-657.28	x	2.92	=	-1919.26	(269*)
Total primary energy kWh/year				∑(261*)...(271*) =	5415.73	(272*)
Primary energy kWh/m2/year				(272*) ÷ (4) =	55.17	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	4 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.29	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 16.27	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 16.27 < TER 16.29	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.30 (max 0.30) 0.30 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.57 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.1, with reference: Test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 180.00 litres Nominal cylinder loss = 1.82kWh/day Maximum permitted cylinder loss = 2.10kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00)	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	4 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		98.16	(1a) x	3.10	(2a) =	304.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	98.16	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	304.30	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			13.10	x	1.42	=	18.54	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			88.03	x	0.30	=	26.41	N/A	N/A	(29a)
Party Wall			69.44	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 103.23 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 49.15 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 10.32 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 59.47 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	37.64	36.18	36.18	33.26	31.31	30.34	29.37	29.37	31.80	33.26	34.72	36.18 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	97.11	95.65	95.65	92.73	90.78	89.81	88.84	88.84	91.27	92.73	94.19	95.65

Average = ∑(39)1...12/12 = 92.77 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.99	0.97	0.97	0.94	0.92	0.91	0.91	0.91	0.93	0.94	0.96	0.97

Average = ∑(40)1...12/12 = 0.95 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.72 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.84 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	108.73	104.77	100.82	96.87	92.91	88.96	88.96	92.91	96.87	100.82	104.77	108.73

∑(44)1...12 = 1186.12 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	161.63	141.36	145.87	127.17	122.03	105.30	97.57	111.97	113.31	132.05	144.14	156.53

∑(45)1...12 = 1558.91 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	24.24	21.20	21.88	19.08	18.30	15.79	14.64	16.80	17.00	19.81	21.62	23.48

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	180.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.87	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.98	(54)
Enter (49) or (54) in (55)	0.98	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	

∑(64)1...12 = 2276.81 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	102.52	91.06	97.28	89.49	89.35	82.22	81.22	86.01	84.88	92.68	95.13	100.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	61.21	54.37	44.21	33.47	25.02	21.12	22.82	29.67	39.82	50.56	59.01	62.91	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	378.09	382.01	372.12	351.08	324.51	299.54	282.85	278.93	288.82	309.86	336.43	361.40	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	(71)
Water heating gains (Table 5)													
(72)m	137.79	135.50	130.75	124.29	120.10	114.19	109.17	115.60	117.89	124.57	132.13	135.51	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	695.58	690.37	665.58	627.33	588.11	553.34	533.34	542.69	565.01	603.49	646.06	678.32	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	2.70	x	37.39	x 0.9 x	0.63	x	0.70	=	30.85	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	100.33	178.54	254.99	346.26	408.80	427.13	413.78	364.67	292.48	208.15	121.68	84.83	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	795.91	868.91	920.57	973.58	996.91	980.47	947.12	907.36	857.50	811.64	767.74	763.15	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.96	0.91	0.78	0.58	0.38	0.40	0.68	0.91	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.35	20.45	20.60	20.77	20.90	20.95	20.96	20.95	20.94	20.80	20.53	20.37	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.09	20.11	20.11	20.13	20.15	20.16	20.16	20.16	20.14	20.13	20.12	20.11	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.98	0.95	0.89	0.73	0.50	0.31	0.32	0.61	0.88	0.98	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.24	19.39	19.61	19.85	20.03	20.09	20.10	20.10	20.06	19.90	19.52	19.28	(90)

Living area fraction fLA 29.20 ÷ (4) = 0.30 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.57	19.71	19.90	20.12	20.29	20.34	20.35	20.35	20.32	20.17	19.82	19.60	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.42	19.56	19.75	19.97	20.14	20.19	20.20	20.20	20.17	20.02	19.67	19.45	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.95	0.88	0.73	0.51	0.31	0.32	0.61	0.88	0.97	0.99	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	783.74	846.27	871.03	860.33	723.01	497.97	293.35	293.30	523.45	711.20	745.69	752.09	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1448.56	1392.29	1238.92	1045.39	766.43	502.26	293.51	293.50	536.03	854.75	1193.53	1391.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	494.63	366.93	273.71	133.24	32.30	0.00	0.00	0.00	0.00	106.80	322.45	476.04	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 2206.08 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 22.47 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	494.63	366.93	273.71	133.24	32.30	0.00	0.00	0.00	0.00	106.80	322.45	476.04
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	545.95	404.99	302.10	147.06	35.65	0.00	0.00	0.00	0.00	117.88	355.90	525.43

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 2434.97 (211)

Water heating:

Output from water heater, kWh/month (calculated above)												
(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50

∑(64)1...12 = 2276.81 (64)

Efficiency of water heater per month												
(217)m	86.98	86.56	85.66	84.04	81.34	79.90	79.90	79.90	79.90	83.41	86.14	86.95
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	255.90	226.93	241.46	221.53	224.97	205.64	198.43	216.45	215.66	231.41	235.83	250.15

Total per year (kWh/year) = ∑(219)1...12 = 2724.37 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2434.97	(211)
Water heating fuel used		2724.37	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	185.62		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	360.62	(231)
Electricity for lighting (calculated in Appendix L):		432.39	(232)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		**Fuel price (Table 12)**		**Fuel cost £/year**	
Space heating - main system 1	2434.97	x	3.10	x 0.01 =	75.48	(240)
Water heating cost (other fuel)	2724.37	x	3.10	x 0.01 =	84.46	(247)
Pumps, fans and electric keep-hot	360.62	x	11.46	x 0.01 =	41.33	(249)
Energy for lighting	432.39	x	11.46	x 0.01 =	49.55	(250)
Additional standing charges (Table 12)					106.00	(251)
Total energy cost			(240)...(242) + (245)...(254)		356.82	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.17	(257)
SAP value		83.66	
SAP rating		84	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	2434.97	x	0.198	=	482.12	(261)
Water heating	2724.37	x	0.198	=	539.42	(264)
Space and water heating			(261) + (262) + (263) + (264) =		1021.55	(265)
Pumps, fans and electric keep-hot	360.62	x	0.517	=	186.44	(267)
Lighting	432.39	x	0.517	=	223.54	(268)
Total carbon dioxide emissions			∑(261)...(271) =		1431.53	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		14.58	(273)
EI value					86.60	
EI rating (see section 14)					87	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	2434.97	x	1.02	=	2483.67	(261*)
Water heating	2724.37	x	1.02	=	2778.85	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		5262.52	(265*)
Pumps, fans and electric keep-hot	360.62	x	2.92	=	1053.01	(267*)
Lighting	432.39	x	2.92	=	1262.57	(268*)
Total primary energy kWh/year			∑(261*)...(271*) =		7578.10	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		77.20	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	4 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 16.29	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 12.13	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 12.13 < TER 16.29	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** **Weighted average** **Highest** Wall 0.20 (max 0.30) 0.20 (max 0.70) Party wall 0.00 (max 0.20) N/A Floor (no floor) Roof (no roof) Openings 1.57 (max 2.00) 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.14, with reference: test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 180.00 litres Nominal cylinder loss = 1.82kWh/day Maximum permitted cylinder loss = 2.10kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00) Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	4 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		98.16	(1a) x	3.10	(2a) =	304.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	98.16	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	304.30	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			13.10	x	1.42	=	18.54	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			88.03	x	0.20	=	17.61	N/A	N/A	(29a)
Party Wall			69.44	x	0.00	=	0.00	N/A	N/A	(32)

Total area of external elements ∑A, m² 103.23 (31)

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 40.34 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 14.45 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 54.80 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	37.64	36.18	36.18	33.26	31.31	30.34	29.37	29.37	31.80	33.26	34.72	36.18 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	92.43	90.97	90.97	88.06	86.11	85.14	84.16	84.16	86.60	88.06	89.52	90.97

Average = ∑(39)1...12/12 = 88.10 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	0.94	0.93	0.93	0.90	0.88	0.87	0.86	0.86	0.88	0.90	0.91	0.93

Average = ∑(40)1...12/12 = 0.90 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.72 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 98.84 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)												
(44)m	108.73	104.77	100.82	96.87	92.91	88.96	88.96	92.91	96.87	100.82	104.77	108.73

∑(44)1...12 = 1186.12 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	161.63	141.36	145.87	127.17	122.03	105.30	97.57	111.97	113.31	132.05	144.14	156.53

∑(45)1...12 = 1558.91 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	24.24	21.20	21.88	19.08	18.30	15.79	14.64	16.80	17.00	19.81	21.62	23.48

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder	180.00	(50)
If community heating and no tank in dwelling, enter 110 litres in box (50)		
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	(51)
If community heating see SAP 2009 section 4.3		
Volume factor from Table 2a	0.87	(52)
Temperature factor from Table 2b	0.54	(53)
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53)	0.98	(54)
Enter (49) or (54) in (55)	0.98	(55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	30.40	27.45	30.40	29.42	30.40	29.42	30.40	30.40	29.42	30.40	29.42	30.40	(57)

Primary circuit loss (annual) from Table 3: 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50	

∑(64)1...12 = 2276.81 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	102.52	91.06	97.28	89.49	89.35	82.22	81.22	86.01	84.88	92.68	95.13	100.82	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	163.31	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	61.21	54.37	44.21	33.47	25.02	21.12	22.82	29.67	39.82	50.56	59.01	62.91	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	378.09	382.01	372.12	351.08	324.51	299.54	282.85	278.93	288.82	309.86	336.43	361.40	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	54.05	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	-108.87	(71)
Water heating gains (Table 5)													
(72)m	137.79	135.50	130.75	124.29	120.10	114.19	109.17	115.60	117.89	124.57	132.13	135.51	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	695.58	690.37	665.58	627.33	588.11	553.34	533.34	542.69	565.01	603.49	646.06	678.32	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	2.70	x	37.39	x 0.9 x	0.63	x	0.70	=	30.85	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	100.33	178.54	254.99	346.26	408.80	427.13	413.78	364.67	292.48	208.15	121.68	84.83	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	795.91	868.91	920.57	973.58	996.91	980.47	947.12	907.36	857.50	811.64	767.74	763.15	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.96	0.90	0.75	0.55	0.36	0.38	0.66	0.90	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.40	20.50	20.65	20.80	20.92	20.95	20.96	20.96	20.94	20.83	20.58	20.42	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	20.13	20.15	20.15	20.17	20.19	20.20	20.21	20.21	20.18	20.17	20.16	20.15	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.98	0.95	0.88	0.70	0.48	0.29	0.31	0.58	0.87	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	19.35	19.50	19.70	19.93	20.09	20.13	20.14	20.14	20.11	19.97	19.62	19.39	(90)

Living area fraction fLA 29.20 ÷ (4) = 0.30 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.66	19.80	19.98	20.19	20.34	20.38	20.38	20.38	20.36	20.23	19.91	19.69	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.51	19.65	19.83	20.04	20.19	20.23	20.23	20.23	20.21	20.08	19.76	19.54	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.94	0.87	0.70	0.49	0.30	0.31	0.59	0.86	0.97	0.98	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	782.97	844.40	866.19	848.05	699.79	476.30	280.61	280.58	503.28	700.57	743.74	751.37	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1387.47	1332.58	1185.84	998.68	730.81	478.93	280.69	280.69	511.67	816.98	1141.78	1332.29	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	449.75	328.06	237.82	108.46	23.07	0.00	0.00	0.00	0.00	86.60	286.59	432.21	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 1952.56 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 19.89 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	449.75	328.06	237.82	108.46	23.07	0.00	0.00	0.00	0.00	86.60	286.59	432.21
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	496.41	362.10	262.49	119.71	25.47	0.00	0.00	0.00	0.00	95.59	316.32	477.05

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 2155.14 (211)

Water heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from water heater, kWh/month (calculated above)												
(64)m	222.60	196.43	206.84	186.18	183.00	164.30	158.55	172.94	172.31	193.02	203.14	217.50

∑(64)1...12 = 2276.81 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Efficiency of water heater per month												
(217)m	86.75	86.27	85.29	83.53	80.97	79.90	79.90	79.90	79.90	82.93	85.83	86.71
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	256.59	227.68	242.52	222.88	226.00	205.64	198.43	216.45	215.66	232.74	236.68	250.83

Total per year (kWh/year) = ∑(219)1...12 = 2732.09 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2155.14	(211)
Water heating fuel used		2732.09	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	185.62		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	360.62	(231)
Electricity for lighting (calculated in Appendix L):		432.39	(232)
Energy saving/generation technologies (Appendices M, N and Q):			
Electricity generated by PVs (Appendix M) (negative quantity)		-657.28	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	2155.14	x	3.10	x 0.01 =	66.81	(240)
Water heating cost (other fuel)	2732.09	x	3.10	x 0.01 =	84.69	(247)
Pumps, fans and electric keep-hot	360.62	x	11.46	x 0.01 =	41.33	(249)
Energy for lighting	432.39	x	11.46	x 0.01 =	49.55	(250)
Additional standing charges (Table 12)					106.00	(251)

Energy saving/generation technologies (Appendices M, N and Q):

PV savings (negative quantity)	-657.28	x	11.46	x 0.01 =	-75.32	(252)
Total energy cost			(240)...(242) + (245)...(254)		273.06	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.90	(257)
SAP value		87.49	
SAP rating		87	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	2155.14	x	0.198	=	426.72	(261)
Water heating	2732.09	x	0.198	=	540.95	(264)
Space and water heating			(261) + (262) + (263) + (264) =		967.67	(265)
Pumps, fans and electric keep-hot	360.62	x	0.517	=	186.44	(267)
Lighting	432.39	x	0.517	=	223.54	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-657.28	x	0.529	=	-347.70	(269)
Total carbon dioxide emissions				∑(261)...(271) =	1029.96	(272)
Dwelling carbon dioxide emissions rate				(272) ÷ (4) =	10.49	(273)
EI value					90.36	
EI rating (see section 14)					90	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	2155.14	x	1.02	=	2198.24	(261*)
Water heating	2732.09	x	1.02	=	2786.74	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		4984.98	(265*)
Pumps, fans and electric keep-hot	360.62	x	2.92	=	1053.01	(267*)
Lighting	432.39	x	2.92	=	1262.57	(268*)
Energy saving/generation technologies:						
PV primary energy savings (negative quantity)	-657.28	x	2.92	=	-1919.26	(269*)
Total primary energy kWh/year				∑(261*)...(271*) =	5381.31	(272*)
Primary energy kWh/m2/year				(272*) ÷ (4) =	54.82	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	5 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 20.26	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 19.98	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 19.98 < TER 20.26	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** — **Weighted average** — **Highest** Wall — 0.30 (max 0.30) — 0.30 (max 0.70) Party wall — 0.00 (max 0.20) — N/A Floor — (no floor) Roof — 0.13 (max 0.20) — 0.13 (max 0.35) Openings — 1.57 (max 2.00) — 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.08, with reference: test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 135.00 litres Nominal cylinder loss = 1.50kWh/day Maximum permitted cylinder loss = 1.77kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 4.50 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than $0.2W/m^2K$: • Part Wall (0.00) Design air permeability of 4.5 $m^3/(h.m^2)$ is less than 5 $m^3/(h.m^2)$ at 50 Pa	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	5 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		82.24	(1a) x	3.10	(2a) =	254.94	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	82.24	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	254.94	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	4.50	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.22	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.17	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.24	0.22	0.22	0.20	0.18	0.17	0.16	0.16	0.18	0.20	0.21	0.22	
											∑(22b)1...12 =	2.36	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.35	0.34	0.34	0.31	0.29	0.28	0.27	0.27	0.30	0.31	0.32	0.34 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.35	0.34	0.34	0.31	0.29	0.28	0.27	0.27	0.30	0.31	0.32	0.34 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			13.40	x	1.42	=	18.96	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			87.73	x	0.30	=	26.32	N/A	N/A	(29a)
Party Wall			57.04	x	0.00	=	0.00	N/A	N/A	(32)
Roof			82.24	x	0.13	=	10.69	N/A	N/A	(30)
Total area of external elements ∑A, m²			185.47 (31)							

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 60.17 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 14.84 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 75.01 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	29.33	28.23	28.23	26.03	24.57	23.83	23.10	23.10	24.93	26.03	27.13	28.23 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	104.34	103.24	103.24	101.04	99.58	98.84	98.11	98.11	99.94	101.04	102.14	103.24

Average = ∑(39)1...12/12 = 101.07 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	1.27	1.26	1.26	1.23	1.21	1.20	1.19	1.19	1.22	1.23	1.24	1.26

Average = ∑(40)1...12/12 = 1.23 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.50 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 93.67 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m	103.04	99.29	95.54	91.80	88.05	84.30	84.30	88.05	91.80	95.54	99.29	103.04

∑(44)1...12 = 1124.04 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	153.17	133.96	138.23	120.52	115.64	99.79	92.47	106.11	107.37	125.14	136.59	148.33

∑(45)1...12 = 1477.32 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	22.97	20.09	20.74	18.08	17.35	14.97	13.87	15.92	16.11	18.77	20.49	22.25	(46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder 135.00 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see SAP 2009 section 4.3

Volume factor from Table 2a 0.96 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) 0.81 (54)

Enter (49) or (54) in (55) 0.81 (55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(57)

Primary circuit loss (annual) from Table 3 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00	

∑(64)1...12 = 2132.75 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	95.46	84.77	90.50	83.17	82.98	76.28	75.28	79.81	78.80	86.14	88.51	93.85	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	51.91	46.11	37.50	28.39	21.22	17.92	19.36	25.16	33.77	42.88	50.05	53.36	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	334.42	337.89	329.14	310.52	287.02	264.94	250.18	246.71	255.46	274.07	297.57	319.66	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	(71)
Water heating gains (Table 5)													

(72)m	128.31	126.14	121.64	115.51	111.54	105.94	101.18	107.28	109.44	115.78	122.94	126.15	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	627.25	622.74	600.88	567.03	532.39	501.40	483.33	491.76	511.28	545.35	583.17	611.77	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	3.00	x	37.39	x 0.9 x	0.63	x	0.70	=	34.28	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	103.76	184.38	262.71	355.75	419.19	437.68	424.12	374.33	301.00	214.79	125.79	87.76	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	731.01	807.13	863.59	922.78	951.58	939.08	907.45	866.09	812.28	760.13	708.96	699.54	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.96	0.92	0.82	0.64	0.44	0.46	0.74	0.93	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.10	20.22	20.41	20.61	20.82	20.92	20.94	20.94	20.89	20.67	20.32	20.13	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	19.87	19.88	19.88	19.90	19.91	19.92	19.93	19.93	19.91	19.90	19.89	19.88	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.98	0.95	0.90	0.76	0.54	0.33	0.34	0.65	0.90	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	18.70	18.87	19.14	19.44	19.71	19.82	19.85	19.85	19.79	19.52	19.03	18.74	(90)

Living area fraction fLA 32.95 ÷ (4) = 0.40 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.26	19.41	19.65	19.91	20.16	20.26	20.28	20.28	20.23	19.98	19.55	19.30	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.11	19.26	19.50	19.76	20.01	20.11	20.13	20.13	20.08	19.83	19.40	19.15	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.95	0.90	0.77	0.56	0.35	0.36	0.66	0.89	0.97	0.98	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	718.33	784.62	817.71	826.31	728.50	527.62	316.09	315.77	539.87	678.57	688.12	688.11	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1524.64	1472.51	1311.28	1117.73	827.11	544.58	317.32	317.27	577.35	912.41	1266.61	1470.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	599.90	462.27	367.21	209.82	73.36	0.00	0.00	0.00	0.00	173.98	416.51	582.30	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 2885.35 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 35.08 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	599.90	462.27	367.21	209.82	73.36	0.00	0.00	0.00	0.00	173.98	416.51	582.30
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	662.14	510.23	405.31	231.59	80.97	0.00	0.00	0.00	0.00	192.03	459.73	642.72

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 3184.72 (211)

Water heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Output from water heater, kWh/month (calculated above)												
(64)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00

∑(64)1...12 = 2132.75 (64)

Efficiency of water heater per month												
(217)m	87.57	87.27	86.59	85.41	82.83	79.90	79.90	79.90	79.90	84.81	86.95	87.56
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	238.47	211.12	223.92	204.18	206.81	192.31	185.40	202.47	201.81	213.18	219.06	232.99

Total per year (kWh/year) = ∑(219)1...12 = 2531.73 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3184.72	(211)
Water heating fuel used		2531.73	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	155.52		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	330.52	(231)
Electricity for lighting (calculated in Appendix L):		366.73	(232)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	3184.72	x	3.10	x 0.01 =	98.73	(240)
Water heating cost (other fuel)	2531.73	x	3.10	x 0.01 =	78.48	(247)
Pumps, fans and electric keep-hot	330.52	x	11.46	x 0.01 =	37.88	(249)
Energy for lighting	366.73	x	11.46	x 0.01 =	42.03	(250)
Additional standing charges (Table 12)					106.00	(251)
Total energy cost				(240)...(242) + (245)...(254)	363.11	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.34	(257)
SAP value		81.29	
SAP rating		81	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	3184.72	x	0.198	=	630.57	(261)
Water heating	2531.73	x	0.198	=	501.28	(264)
Space and water heating			(261) + (262) + (263) + (264) =		1131.86	(265)
Pumps, fans and electric keep-hot	330.52	x	0.517	=	170.88	(267)
Lighting	366.73	x	0.517	=	189.60	(268)
Total carbon dioxide emissions			∑(261)...(271) =		1492.33	(272)
Dwelling carbon dioxide emissions rate			(272) ÷ (4) =		18.15	(273)
EI value					84.28	
EI rating (see section 14)					84	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	3184.72	x	1.02	=	3248.41	(261*)
Water heating	2531.73	x	1.02	=	2582.36	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		5830.77	(265*)
Pumps, fans and electric keep-hot	330.52	x	2.92	=	965.11	(267*)
Lighting	366.73	x	2.92	=	1070.84	(268*)
Total primary energy kWh/year			∑(261*)...(271*) =		7866.72	(272*)
Primary energy kWh/m2/year			(272*) ÷ (4) =		95.66	(273*)

L1A 2010 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	5 Charlotte Street, London, W1T 4QH		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 20.26	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 15.02	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 15.02 < TER 20.26	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.20 (max 0.30) / 0.20 (max 0.70) Party wall: 0.00 (max 0.20) / N/A Floor: (no floor) Roof: 0.13 (max 0.20) / 0.13 (max 0.35) Openings: 1.57 (max 2.00) / 2.00 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.09, with reference: test	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Potterton Promax 24/2 HE Plus Efficiency = 89.60% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 135.00 litres Nominal cylinder loss = 1.50kWh/day Maximum permitted cylinder loss = 1.77kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 20 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	**Passed**
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Not significant Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 6.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	**Passed**
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	**Passed**
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.40 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 91.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	**Passed**
Have the key features of the design been included (or bettered) in practice?	The following walls/wall have a U-value less than 0.2W/m^2K: • Part Wall (0.00) Use of the following low carbon or renewable technologies: • Photovoltaic array	Authorised SAP Assessor	

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Neil Vanson	Assessor number	6290
Client		Last modified	14/02/2012
Address	5 Charlotte Street, London, W1T 4QH		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		82.24	(1a) x	3.10	(2a) =	254.94	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	82.24	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	254.94	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.25	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered		3	(19)
Shelter factor	1 - [0.075 x (19)] =	0.78	(20)
Adjusted infiltration rate	(18) x (20) =	0.19	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
											∑(22)1...12 =	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
											∑(22a)1...12 =	13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.26	0.25	0.25	0.22	0.20	0.19	0.18	0.18	0.20	0.22	0.23	0.25	
											∑(22b)1...12 =	2.62	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0.50	(23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100] =

(24a)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.37	0.36	0.36	0.33	0.31	0.30	0.29	0.29	0.32	0.33	0.35	0.36 (25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window*			13.40	x	1.42	=	18.96	N/A	N/A	(27)
Doors			2.10	x	2.00	=	4.20	N/A	N/A	(26)
External wall			87.73	x	0.20	=	17.55	N/A	N/A	(29a)
Party Wall			57.04	x	0.00	=	0.00	N/A	N/A	(32)
Roof			82.24	x	0.13	=	10.69	N/A	N/A	(30)
Total area of external elements ∑A, m²			185.47 (31)							

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) (26)...(30) + (32) = 51.40 (33)

Heat capacity Cm = ∑(A x κ) (28)...(30) + (32) + (32a)...(32e) = N/A (34)

Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K 16.69 (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 68.09 (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	31.53	30.31	30.31	27.87	26.24	25.42	24.61	24.61	26.64	27.87	29.09	30.31 (38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	99.63	98.40	98.40	95.96	94.33	93.51	92.70	92.70	94.74	95.96	97.18	98.40

Average = ∑(39)1...12/12 = 95.99 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	1.21	1.20	1.20	1.17	1.15	1.14	1.13	1.13	1.15	1.17	1.18	1.20

Average = ∑(40)1...12/12 = 1.17 (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N 2.50 (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 93.67 (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m	103.04	99.29	95.54	91.80	88.05	84.30	84.30	88.05	91.80	95.54	99.29	103.04

∑(44)1...12 = 1124.04 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	153.17	133.96	138.23	120.52	115.64	99.79	92.47	106.11	107.37	125.14	136.59	148.33

∑(45)1...12 = 1477.32 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	22.97	20.09	20.74	18.08	17.35	14.97	13.87	15.92	16.11	18.77	20.49	22.25	(46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder 135.00 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see SAP 2009 section 4.3

Volume factor from Table 2a 0.96 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) 0.81 (54)

Enter (49) or (54) in (55) 0.81 (55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	25.09	22.66	25.09	24.28	25.09	24.28	25.09	25.09	24.28	25.09	24.28	25.09	(57)

Primary circuit loss (annual) from Table 3 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00	

∑(64)1...12 = 2132.75 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	95.46	84.77	90.50	83.17	82.98	76.28	75.28	79.81	78.80	86.14	88.51	93.85	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	150.24	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	51.91	46.11	37.50	28.39	21.22	17.92	19.36	25.16	33.77	42.88	50.05	53.36	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	334.42	337.89	329.14	310.52	287.02	264.94	250.18	246.71	255.46	274.07	297.57	319.66	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	-100.16	(71)
Water heating gains (Table 5)													

(72)m	128.31	126.14	121.64	115.51	111.54	105.94	101.18	107.28	109.44	115.78	122.94	126.15	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	627.25	622.74	600.88	567.03	532.39	501.40	483.33	491.76	511.28	545.35	583.17	611.77	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southwest	0.77	x	3.00	x	37.39	x 0.9 x	0.63	x	0.70	=	34.28	(79)
Northeast	0.77	x	6.24	x	11.51	x 0.9 x	0.63	x	0.70	=	21.95	(75)
Southeast	0.77	x	4.16	x	37.39	x 0.9 x	0.63	x	0.70	=	47.53	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	103.76	184.38	262.71	355.75	419.19	437.68	424.12	374.33	301.00	214.79	125.79	87.76	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	731.01	807.13	863.59	922.78	951.58	939.08	907.45	866.09	812.28	760.13	708.96	699.54	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	0.99	0.98	0.96	0.92	0.80	0.61	0.42	0.44	0.72	0.92	0.98	0.99	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.16	20.28	20.46	20.66	20.85	20.93	20.94	20.94	20.90	20.71	20.38	20.19	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	19.91	19.93	19.93	19.95	19.96	19.97	19.98	19.98	19.96	19.95	19.94	19.93	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.97	0.95	0.89	0.74	0.52	0.31	0.33	0.63	0.89	0.97	0.99	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	18.82	19.00	19.26	19.55	19.79	19.88	19.90	19.90	19.85	19.61	19.15	18.86	(90)

Living area fraction fLA 32.95 ÷ (4) = 0.40 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
(92)m	19.36	19.51	19.74	19.99	20.21	20.30	20.32	20.32	20.27	20.05	19.64	19.39	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate													
(93)m	19.21	19.36	19.59	19.84	20.06	20.15	20.17	20.17	20.12	19.90	19.49	19.24	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)													
Utilisation factor for gains, ηm													
(94)m	0.98	0.97	0.94	0.89	0.75	0.54	0.33	0.35	0.64	0.88	0.97	0.98	(94)
Useful gains, ηmGm, W = (94)m x (84)m													
(95)m	717.96	783.60	814.94	818.81	711.56	507.22	302.37	302.16	523.42	672.37	687.11	687.78	(95)
Monthly average external temperature from Table 8													
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean internal temperature, Lm, W													
(97)m	1465.29	1413.05	1258.50	1069.21	789.04	519.02	303.11	303.09	551.51	873.32	1213.89	1411.39	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m													
(98)m	556.01	422.99	330.01	180.29	57.65	0.00	0.00	0.00	0.00	149.51	379.29	538.37	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 2614.10 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 31.79 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11)	0.00	(201)
Fraction of space heating from main system(s) 1 - (201)	1.00	(202)
Fraction of space heating from main system 2	0.00	(203)
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00	(204)
Fraction of total space heat from main system 2 (202) x (203)	0.00	(205)
Efficiency of main space heating system 1 (%)	90.60	(206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement, kWh/month (as calculated above)												
(98)m	556.01	422.99	330.01	180.29	57.65	0.00	0.00	0.00	0.00	149.51	379.29	538.37
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)												
(211)m	613.69	466.87	364.24	199.00	63.63	0.00	0.00	0.00	0.00	165.02	418.64	594.22

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 2885.32 (211)

Water heating:

Output from water heater, kWh/month (calculated above)												
(64)m	208.83	184.24	193.90	174.39	171.31	153.66	148.13	161.77	161.25	180.80	190.47	204.00

∑(64)1...12 = 2132.75 (64)

Efficiency of water heater per month												
(217)m	87.40	87.06	86.32	85.00	82.35	79.90	79.90	79.90	79.90	84.41	86.72	87.38
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m												
(219)m	238.93	211.62	224.63	205.15	208.02	192.31	185.40	202.47	201.81	214.19	219.64	233.45

Total per year (kWh/year) = ∑(219)1...12 = 2537.63 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2885.32	(211)
Water heating fuel used		2537.63	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	155.52		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	330.52	(231)
Electricity for lighting (calculated in Appendix L):		366.73	(232)
Energy saving/generation technologies (Appendices M, N and Q):			
Electricity generated by PVs (Appendix M) (negative quantity)		-657.28	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	2885.32	x	3.10	x 0.01 =	89.45	(240)
Water heating cost (other fuel)	2537.63	x	3.10	x 0.01 =	78.67	(247)
Pumps, fans and electric keep-hot	330.52	x	11.46	x 0.01 =	37.88	(249)
Energy for lighting	366.73	x	11.46	x 0.01 =	42.03	(250)
Additional standing charges (Table 12)					106.00	(251)

Energy saving/generation technologies (Appendices M, N and Q):

PV savings (negative quantity)	-657.28	x	11.46	x 0.01 =	-75.32	(252)
Total energy cost			(240)...(242) + (245)...(254)		278.69	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.03	(257)
SAP value		85.64	
SAP rating		86	(258)
SAP band		B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	2885.32	x	0.198	=	571.29	(261)
Water heating	2537.63	x	0.198	=	502.45	(264)
Space and water heating			(261) + (262) + (263) + (264) =		1073.74	(265)
Pumps, fans and electric keep-hot	330.52	x	0.517	=	170.88	(267)
Lighting	366.73	x	0.517	=	189.60	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-657.28	x	0.529	=	-347.70	(269)
Total carbon dioxide emissions				∑(261)...(271) =	1086.52	(272)
Dwelling carbon dioxide emissions rate				(272) ÷ (4) =	13.21	(273)
EI value					88.56	
EI rating (see section 14)					89	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	2885.32	x	1.02	=	2943.03	(261*)
Water heating	2537.63	x	1.02	=	2588.38	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		5531.41	(265*)
Pumps, fans and electric keep-hot	330.52	x	2.92	=	965.11	(267*)
Lighting	366.73	x	2.92	=	1070.84	(268*)
Energy saving/generation technologies:						
PV primary energy savings (negative quantity)	-657.28	x	2.92	=	-1919.26	(269*)
Total primary energy kWh/year				∑(261*)...(271*) =	5648.10	(272*)
Primary energy kWh/m2/year				(272*) ÷ (4) =	68.68	(273*)